



**TAIWAN
TECH**

National Taiwan University of
Science and Technology

Camera-based Contactless Pulse Rate Detection System

TW054 BEST Ice Cream

National Taiwan University of Science and Technology

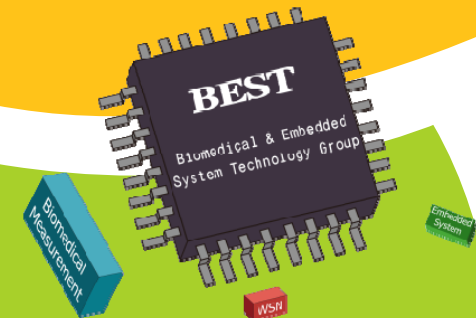
Yu-Chen Lin

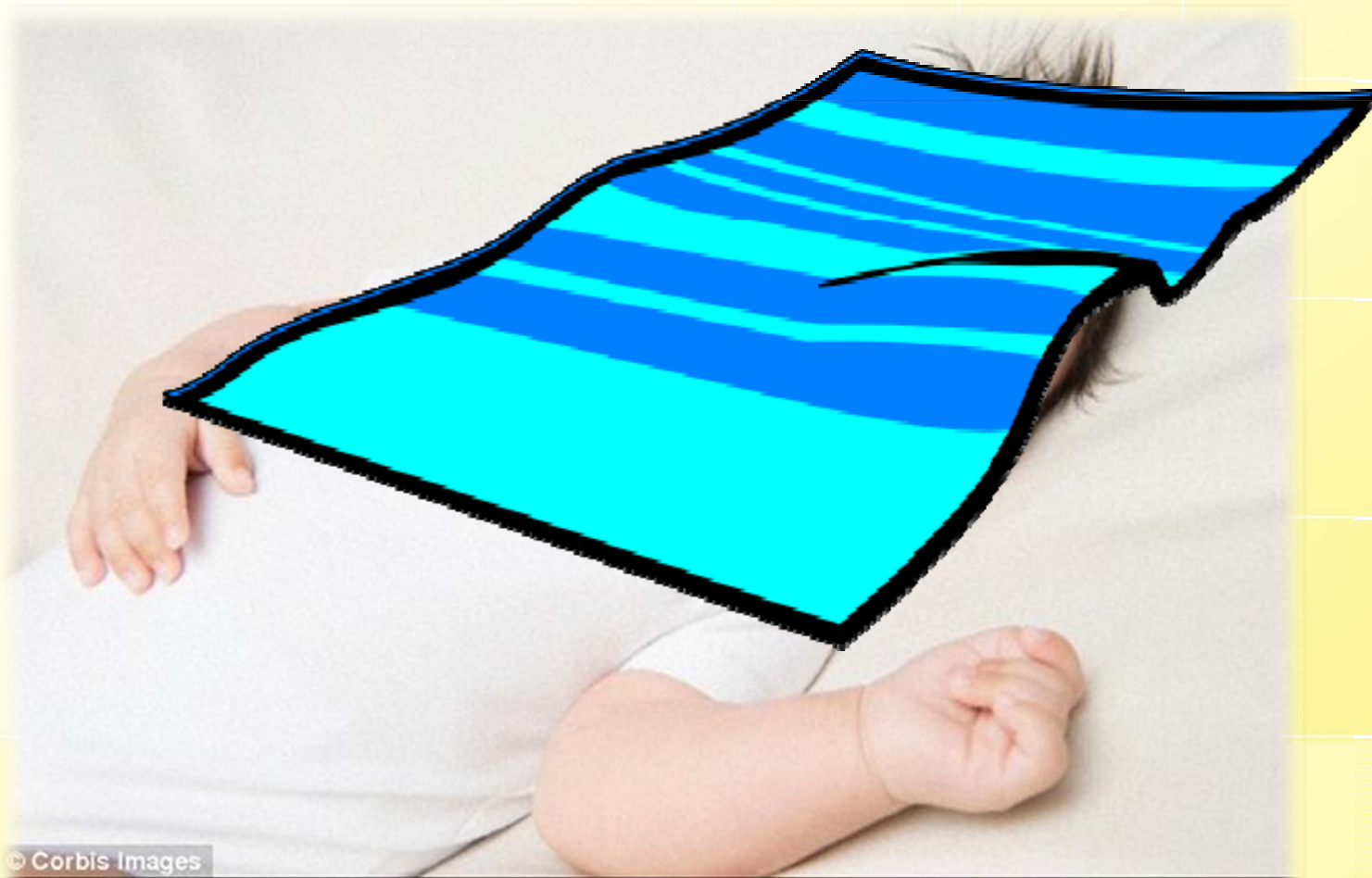
Guan-You Lin

Meng-Han Lee

Advisor : Yuan-Hsiang Lin

Date : 11th. Jul. 2015





© Corbis Images

Half of babies born in the U.S. are at risk of suffocating in their sleep because they sleep with 'potentially hazardous bedding', the American Academy of Paediatrics found (file picture)





Market Products



Background

Sign of Life

Cardiac Diseases

Blood Pressure

**Blood Oxygen Saturation
(SpO₂)**



**Photoplethysmopgraphy
(PPG)**

Background – Physiological signal

Contact Measurement

Non-Contact Measurement



Suitable for Long term Monitoring

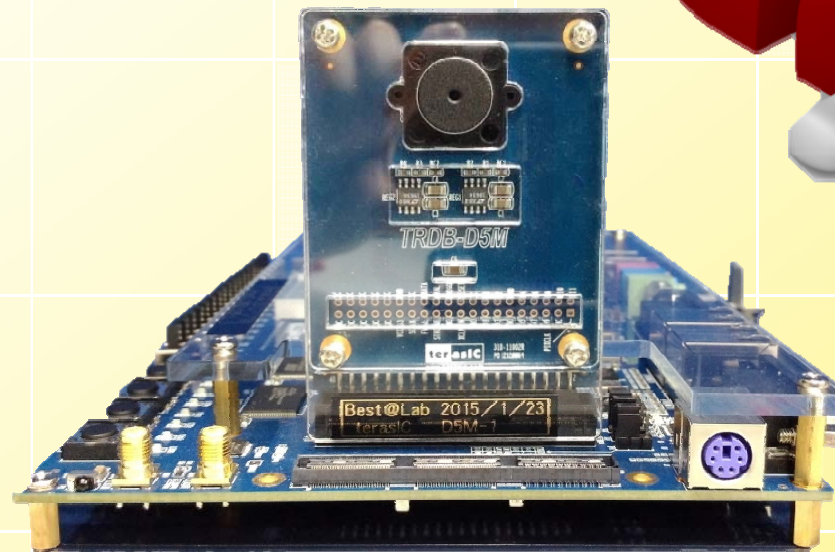
WANTED



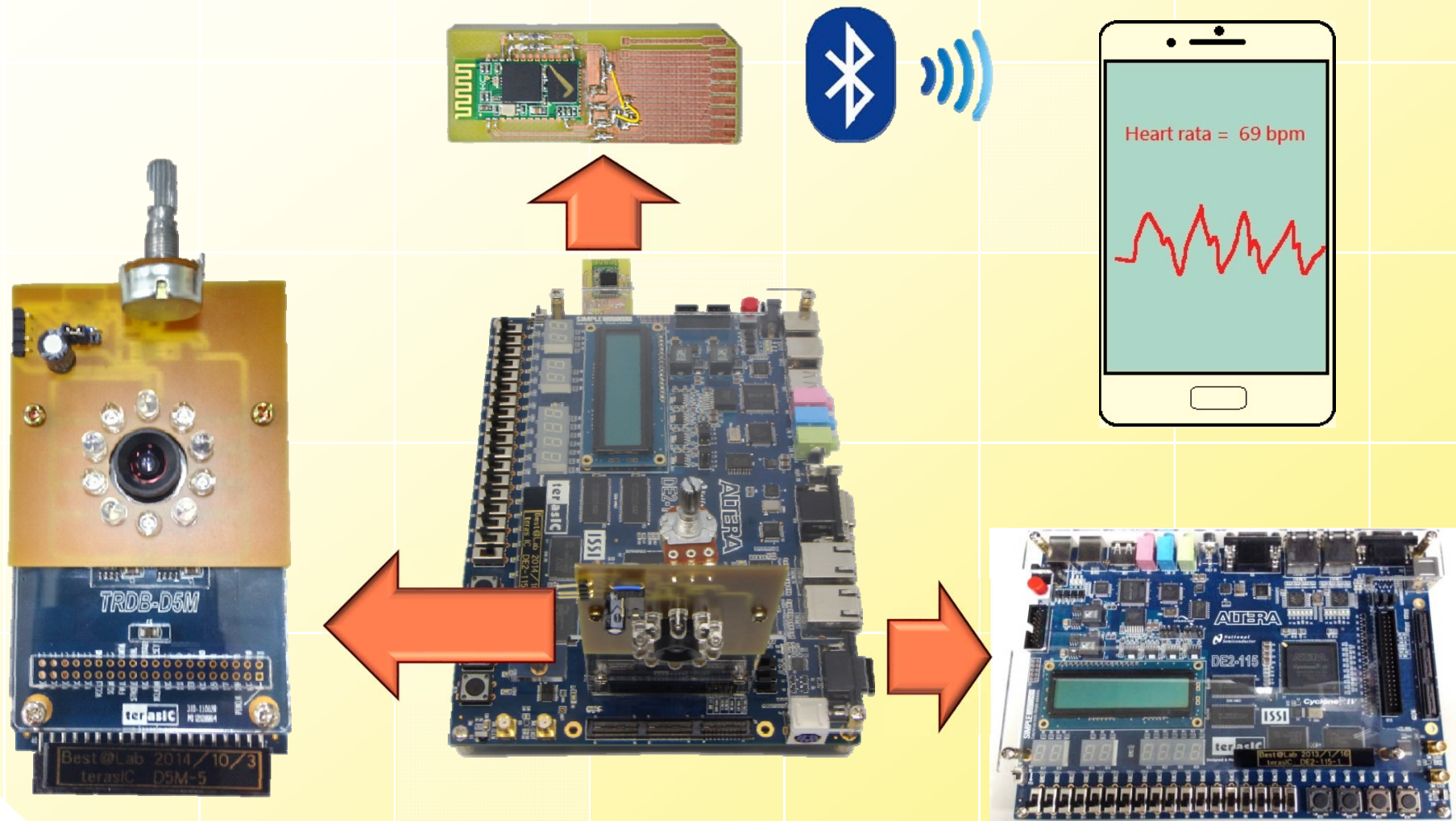
Sleeping Quality

Non-Contact Activities

Suffocation Detection



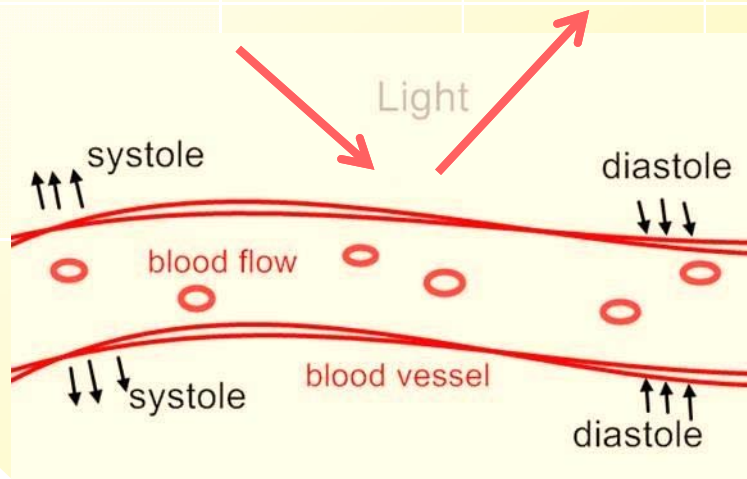
Proposed Idea



Principle

- Remote Photoplethysmography (Remote PPG)
- To detect the changes of reflected light in the skin

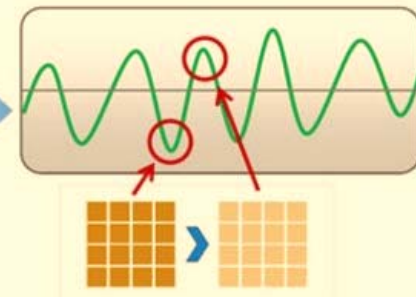
RPPG Signal



Changes in brightness of the face

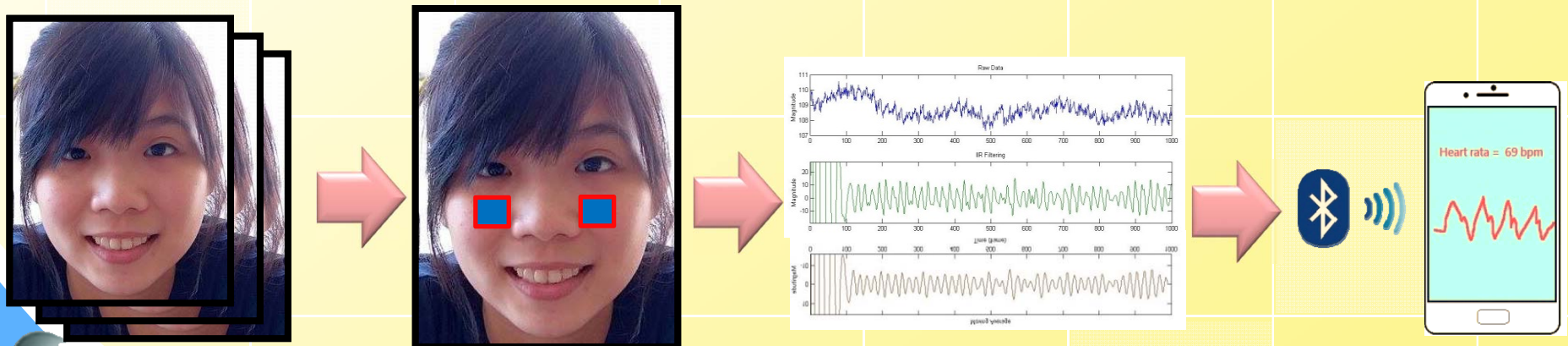


Pulse rate calculation

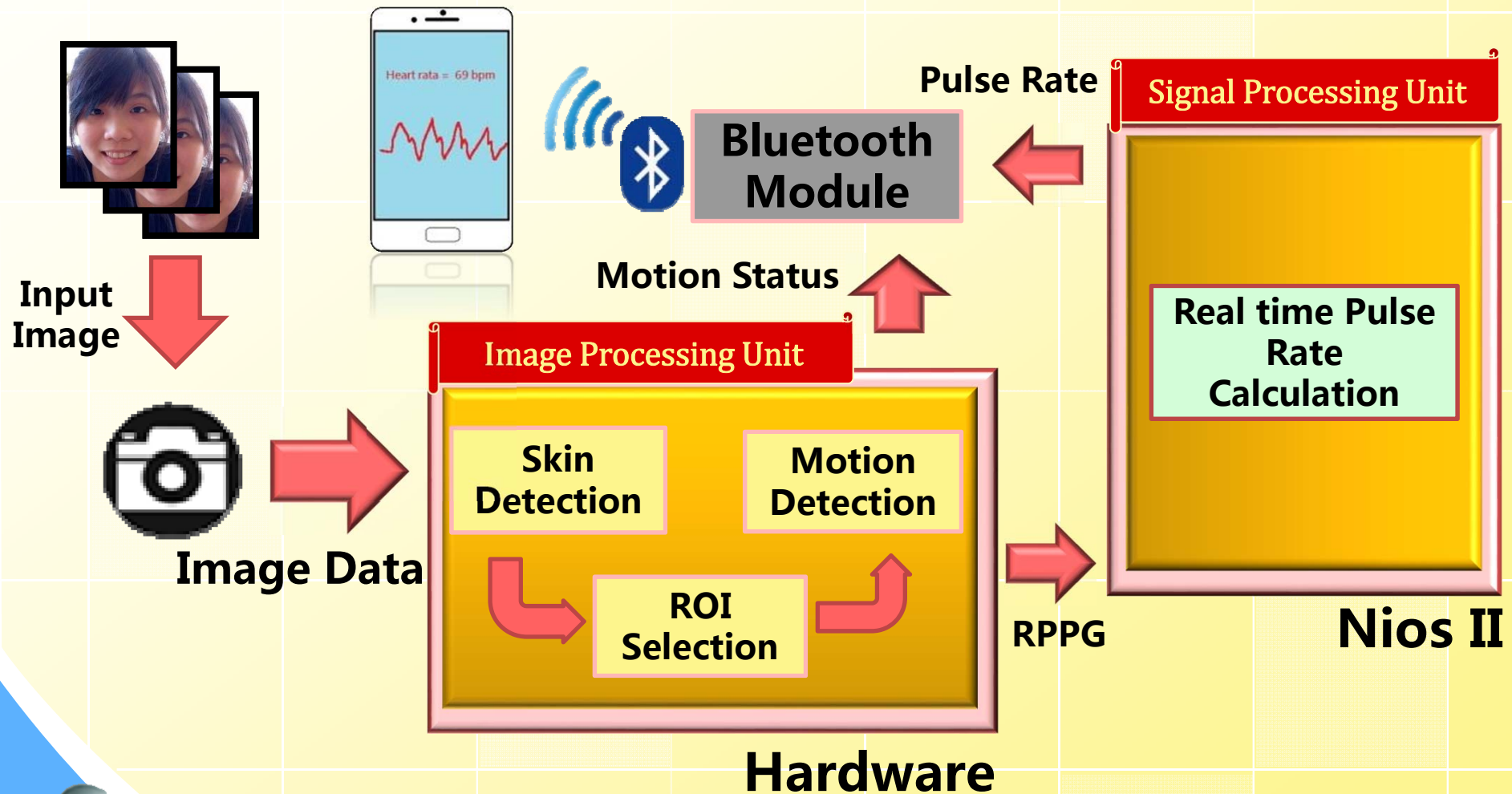


Methods

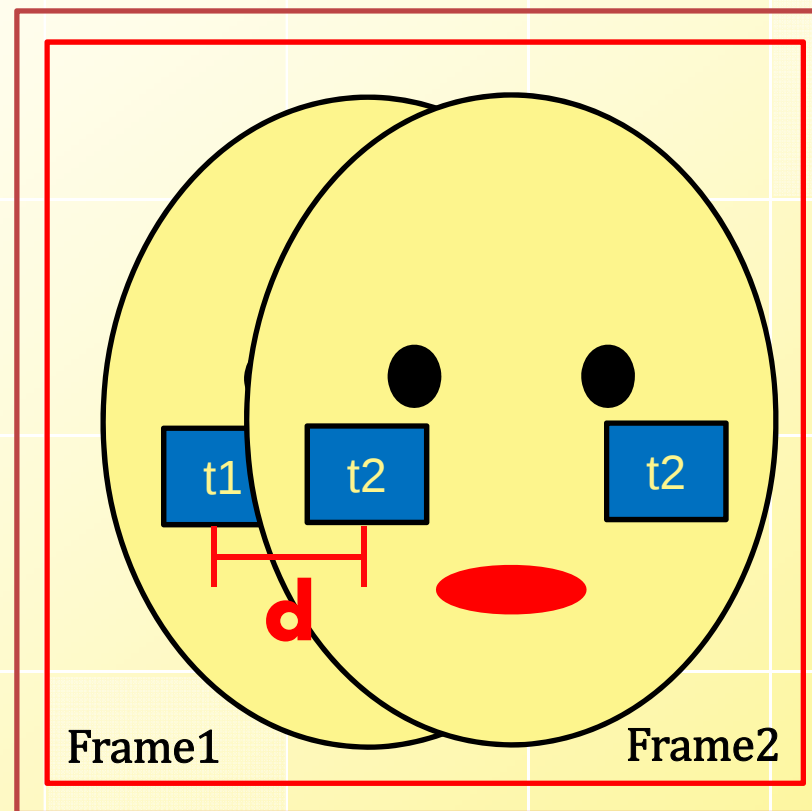
- D5M Camera
- DE2-115 – Cyclone IV
- SoPC – Nios II CPU
- Wireless Communication



System Architecture



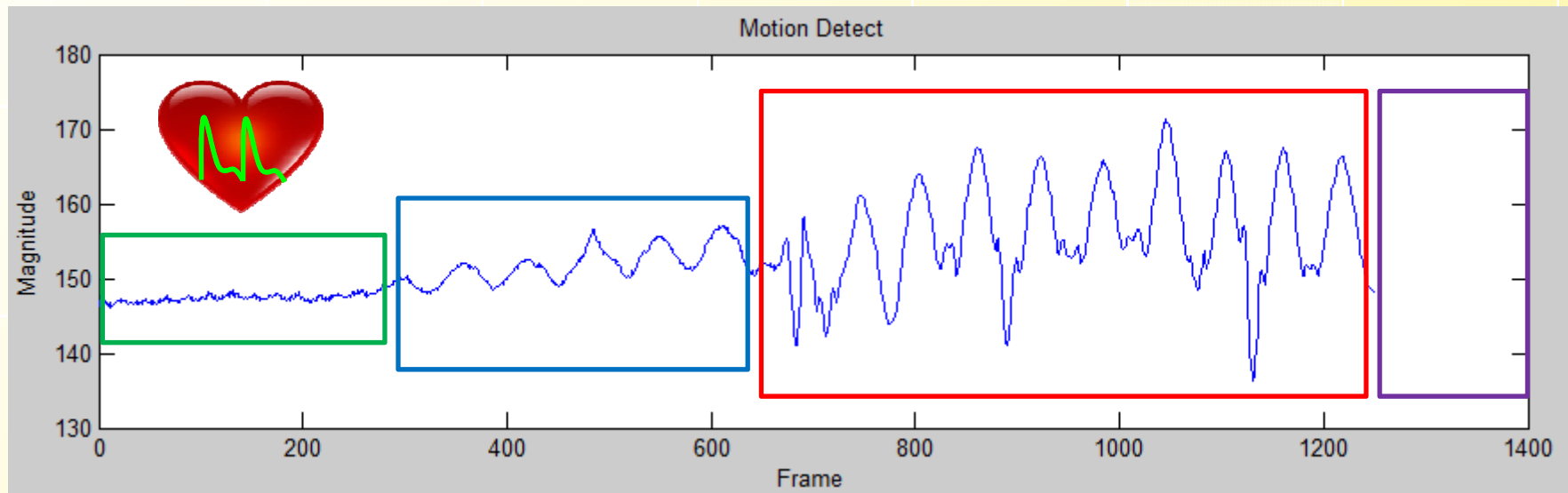
Activity Detection



Activity Detection



Accuracy



At Rest

Actively Fidget

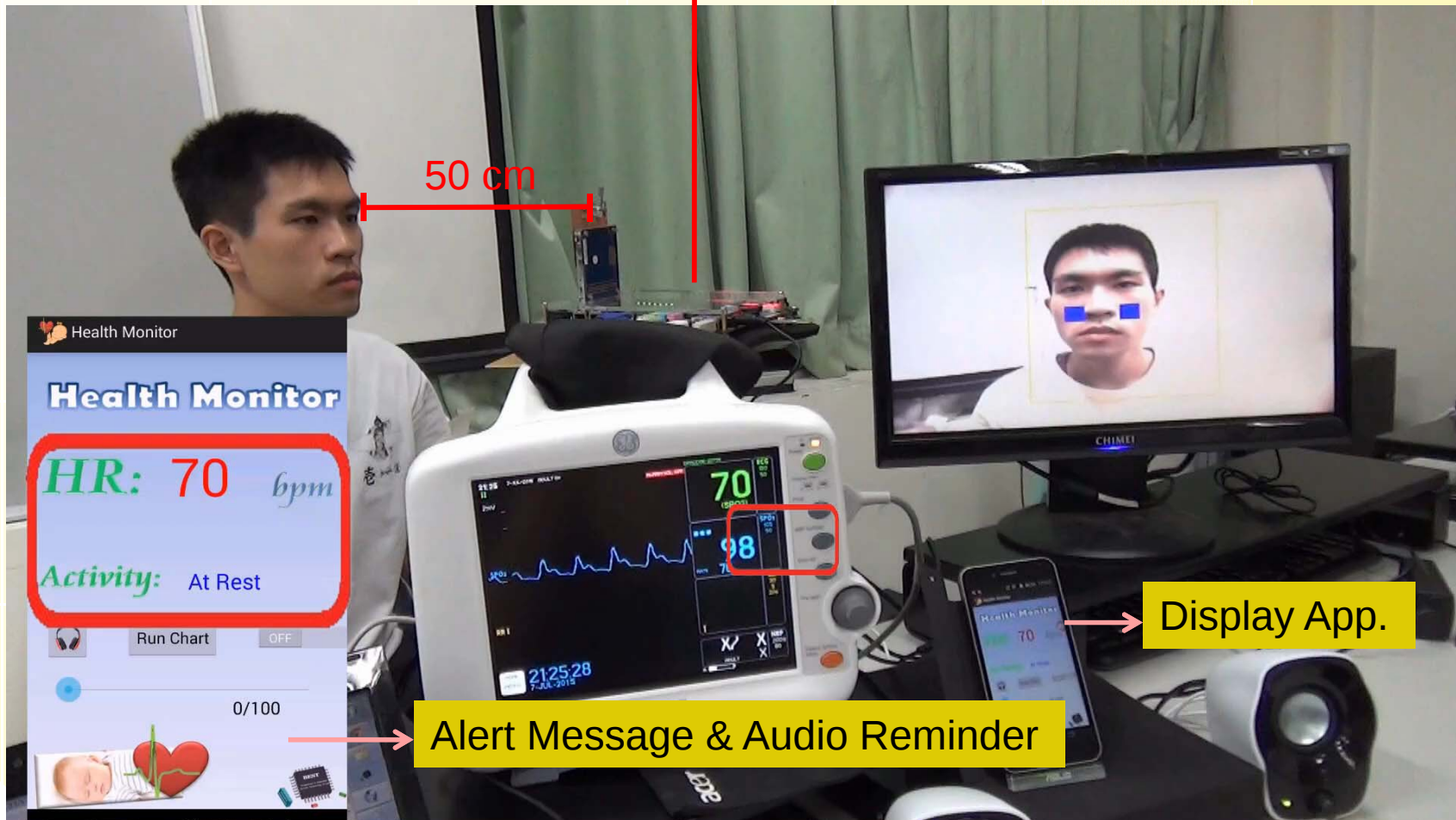
Mild Movement

Suffocation

Results

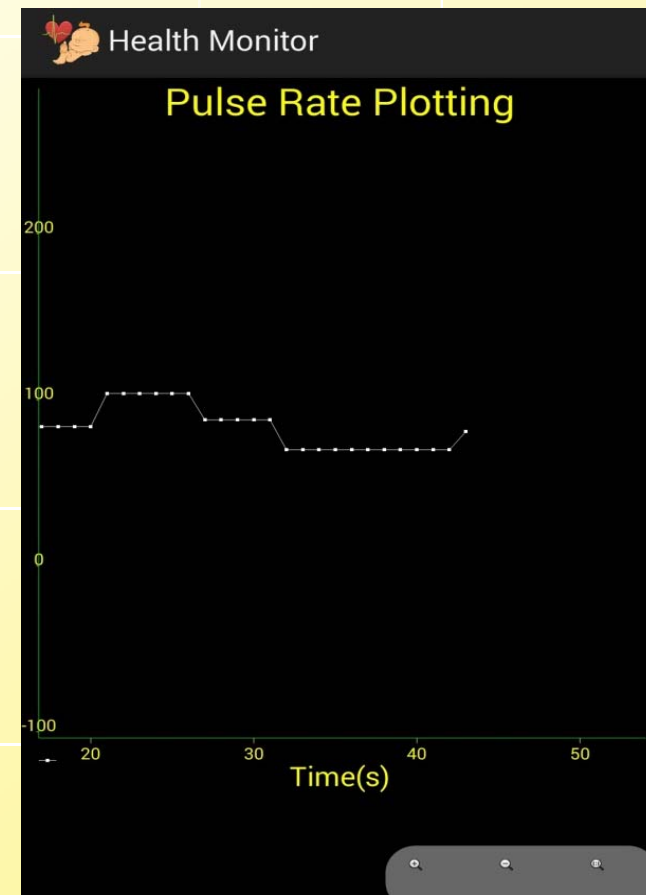
DE2-115 FPGA

50 cm



Results

Audio Reminder



Suffocation Detection --Vibrate Alert

Accuracy Verification



Average Error :

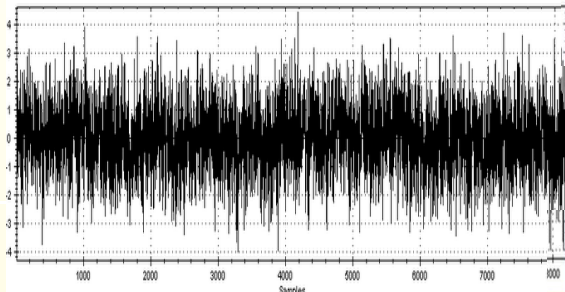
± 3 bpm / 10 subjects

GE Dash 3000

Problems & Solutions



Face & Motion Detection



Sunlight



Incandescent
Light



Florescent
Light

Adjust Exposure Compensation & Night Mode Detection

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System Advantages

Our System					Other Products
	Real-time Contactless Pulse Rate Detection				
	Motion Detect (Sleeping Quality Assessment)				
	Suffocation Detection				
	Night Mode Detection				
	High Speed Hardware Acceleration				
	Embeddable				
	Cost Effective				

Future Works & Applications



Infants / Babies



Elders Health Care



Driver



Bed Monitoring

Thank You for Your Attention !

